absorption will probably have but little affected its practical value in the work on which it was actually employed.

BROOKS'S COMET.—Dr. Franz gives in the *Dun Echt Circular*, No. 151, the following elements and ephemeris for this object, based upon observations obtained with the Königsberg heliometer on August 27, 28, and 29 :—

T = 1887 October 13·6623 Berlin M.T.

$$\left.\begin{aligned}\pi - \Omega &= 72^\circ\ 9'{\cdot}7\\ \Omega &= 85\ \ 29{\cdot}2\\ \iota &= 45\ \ 49{\cdot}0\end{aligned}\right\}\ \text{Mean Eq. 1887·0.}$$

$$\log q = 0{\cdot}08481$$

For Berlin Midnight.

1887.	R.A. h. m. s.	Decl. ° ′	Log *r*.	Log Δ.	Brightness.
Sept. 16	10 16 6	29 55·3 N.	0·0861	0·2843	1·5
20	10 36 30	29 31·3	0·0785	0·2779	1·6
24	10 57 10	28 56·5	0·0719	0·2725	1·7
24	11 17 57	28 10·4 N.	0·0663	0·2682	1·8

The brightness on August 27 is taken as unity.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1887 SEPTEMBER 18–24.

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on September 18

Sun rises, 5h. 41m.; souths, 11h. 54m. 8·9s.; sets, 18h. 7m.; decl. on meridian, 1° 54′ N.: Sidereal Time at Sunset, 17h. 56m.

Moon (at First Quarter Sept. 24, 5h.) rises, 6h. 30m.; souths, 12h. 50m.; sets, 18h. 55m.; decl. on meridian, 0° 11′ N.

Planet	Rises. h. m.	Souths. h. m.	Sets. h. m.	Decl. on meridian. ° ′
Mercury	6 15	12 20	18 25	0 15 N.
Venus	6 36	11 59	17 22	8 2 S.
Mars	1 42	9 20	16 58	17 45 N.
Jupiter	9 27	14 26	19 25	12 28 S.
Saturn	0 44	8 35	16 26	19 38 N.

Occultation of Star by the Moon (visible at Greenwich).

Sept.	Star.	Mag.	Disap. h. m.	Reap. h. m.	Corresponding angles from vertex to right for inverted image. ° °
24	29 Sagittarii	6	22 43	23 24	180 264

Sept.	h.	
20	6	Jupiter in conjunction with and 4° 18′ south of the Moon.
21	16	Venus in inferior conjunction with the Sun.
23	9	Sun in equator.

Variable Stars.

Star.	R.A. h. m.	Decl. ° ′		h. m.	
λ Tauri	3 54·4	12 10 N.	Sept. 19,	0 51	*m*
			,, 22,	23 43	*m*
R Canis Minoris	7 2·5	10 12 N.	,, 21,		*M*
U Monocerotis	7 25·4	9 33 S.	,, 24,		*M*
S Cancri	8 37·5	19 26 N.	,, 18,	3 39	*m*
δ Libræ	14 54·9	8 4 S.	,, 19,	3 39	*m*
			,, 23,	19 22	*m*
U Coronæ	15 13·6	32 4 N.	,, 23,	0 17	*m*
U Ophiuchi	17 10·8	1 20 N.	,, 21,	3 59	*m*
		and at intervals of		20 8	
X Sagittarii	17 40·5	27 47 S.	Sept. 21,	23 0	*m*
			,, 24,	20 0	*M*
W Sagittarii	17 57·8	29 35 S.	,, 19,	19 0	*m*
β Lyræ	18 45·9	33 14 N.	,, 21,	22 0	*M*
η Aquilæ	19 46·7	0 43 N.	,, 18,	23 0	*m*
δ Cephei	22 25·0	57 50 N.	,, 22,	20 0	*M*

M signifies maximum; *m* minimum.

Meteor-Showers.

	R.A.	Decl.	
Near α Arietis	31°	20° N.	
,, η Aurigæ	74	41 N.	Swift; streaks.
,, δ Draconis	290	70 N.	Swift.

GEOGRAPHICAL NOTES.

To the September number of *Petermann's Mitteilungen* Dr. G. Gürich contributes a useful sketch of the geological structure of the African continent. Much of his article is devoted to the Atlas and Cape regions, and that naturally, since on these regions the material is most abundant, only scanty notes for the most part being available for Central Africa, where, however, the prominence of granite Dr. Gürich thinks specially noteworthy. To the same number Dr. Baumann, the companion of Dr. Lenz, contributes a fairly detailed study of the physical geography of Fernando Po, where he stayed for some time on his return from the Congo. Both papers are illustrated by maps, that of Fernando Po being a specially good one on a large scale. Dr. Radde continues his preliminary account of his journeys in 1886 into the Transcaspian region and North Khorassan.

HERR ED. GLASER contemplates a third journey into Southern Arabia, and will attempt to explore the northern and eastern part of the old Sabæan kingdom, which in his first two journeys he was not able to reach. If political conditions permit, he will also cross the Serat Mountains into a part of Hadramaut hitherto almost unexplored.

AN original communication of some value on the aboriginal Indian races of Vera Cruz, Mexico, by Consul A. Baker, will be found in the September number of the Proceedings of the Royal Geographical Society.

IN the course of a short exploratory visit of six weeks' duration, in March and April last, to the delta region known as Aird River, New Guinea, Mr. Theodore Bevan made the important discovery of two large rivers, flowing from the interior highlands, at a distance apart of about 60 miles, into that part of the Gulf of Papua. One of these, the Douglas, enters the head of the Aird delta, and the other discharges at Bald Head; both rivers were navigated for about 100 miles.

WITH reference to the recent Russian expedition to the New Siberian Islands, we learn further that Von Soll made a special exploration of the mountain in New Siberia known to travellers of the beginning of the present century as the "Wood Mountain," which was found to be a beautiful Tertiary profile with carbonized tree trunks, and a rich collection of leaf impressions and fruits, corresponding exactly with the Tertiary flora of Greenland and Spitzbergen, as described by Heer. He made a complete circuit of Kotelnoy Island in forty days, obtaining from the northern point a view of the still untrodden land of Ssanikow, 100 miles distant. The northern part of Kotelnoy is Devonian, and the southern Trias. On Liakov Island, Dr. Bunge found that, with the exception of some granite peaks, the prevailing formation is Quaternary. The ice blocks are covered with loamy deposits, in which are found fossil bones. Besides the fossil remains of the mammoth, rhinoceros, and musk-ox, Dr. Bunge discovered the remains of two species of oxen, deer, horses, and some smaller animals. About seventy Phanerogams were collected. Both birds and insects are poorly represented.

THE India-rubber, Gutta-percha, and Telegraph Works Company have issued tables of the soundings taken by their vessels in 1885–87 in the two Havanna expeditions, the second West African expedition, and the Congo repairs expedition.

GRANTS FOR SCIENCE AND ART INSTRUCTION.

A SUMMARY of grants made by the Department of Science and Art is printed in the new number of the "Directory," issued by the Department, containing regulations for establishing and conducting Science and Art schools and classes. The summary is as follows :—

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1. Payments to the Local Committees of Schools and Classes on the results of instruction, as tested by Examination, of Students of the Industrial Classes.

Science.	Art.
(*a*) £2 and £1 for a 1st and 2nd class respectively in the Elementary and Advanced Stage of each subject. (*b*) £4 and £2 for a 1st and 2nd class respectively in Honours. (*c*) In Practical Chemistry and Practical Metallurgy £2 and £1 for a 1st and 2nd class respectively in the Elementary Stage, £3 and £2 in the Advanced Stage, and £4 and £3 in Honours.	(*a*) £1 and 10*s*. for a 1st and 2nd class respectively in each subject of the 2nd Grade Examination, *including Modelling*. (*b*) £1 10*s*. and £3 for a 1st and 2nd class respectively in 3rd Grade Examination. (*c*) £2 or less per student for works executed in local classes. (*d*) £3 each on account of Free Students (being artisans) under certain conditions. (*e*) £15 each for not more than two Art Pupil Teachers. (*f*) £5 for each student who obtains a National Scholarship or who obtains admission to Training Class.

2. Prizes and medals are awarded to candidates.

(*a*) Prizes to students obtaining a 1st Class in the Advanced Stage of each subject, and Bronze Medals to those obtaining a 1st Class in Honours. Certificates or cards to all successful candidates.	(*a*) Prizes of books or instruments, to the value of 8*s*. and 12*s*., to students obtaining the mark "excellent" in the 2nd and 3rd Grade Examinations, respectively; and Gold, Silver, and Bronze Medals, and other prizes of Books, for the best works submitted in the National Competition of works of all the Schools of Art and Art Classes.

3. Science and Art Scholarships for Students of the Industrial Class, held locally, £4, £7, and £10, for the 1st, 2nd, and 3rd year respectively, on condition that a local contribution of £5 a year is made.

4. Local Exhibitions, to be held by Students of the Industrial Classes at the Normal School of Science and Royal School of Mines, London, the Royal College of Science, Dublin, or at an approved Provincial Science College, £25 to meet an equal sum locally raised.

5. Grants for Buildings, Fittings, and Apparatus.

(*a*) Not exceeding 2*s*. 6*d*. per square foot of internal area up to a maximum of £500 for buildings. (*b*) Grants towards the purchase of fittings, apparatus, examples, &c., not exceeding 50 per cent. of their cost within certain limits.	(*a*) Not exceeding 2*s*. 6*d*. per square foot of internal area up to a maximum of £500 for buildings. (*b*) Grants towards the purchase of fittings, apparatus, examples, &c., not exceeding 50 per cent. of their cost and within certain limits.

6. Special Grants to Organized Science Schools in addition to the foregoing. 10*s*. and 5*s*. respectively for each student who attends a day or an evening school not less than 250 or 75 times in the year.

7. Aid to Students in attending the Normal School of Science and Royal School of Mines, London, the National Art Training School, London, and the Royal College of Science, Dublin.

(*a*) 21 Royal Exhibitions (seven awarded each year) with maintenance allowance of £50 a year tenable for three years. (*b*) 36 National Scholarships (twelve awarded each year) with maintenance allowance of 30*s*. a week for 40 weeks in the year tenable for three years. (*c*) 18 Free Studentships (six awarded each year) tenable for three years, at Normal School of Science and Royal School of Mines, London.	(*a*) National Scholarships tenable for not more than three years at National Art Training School with maintenance allowance of 20*s*. a week. (*b*) Free Studentships in National Art Training School.

8. Aid to teachers and persons preparing to become teachers in attending the Normal School of Science and Royal School of Mines, London, the National Art Training School, London, the Royal College of Science, Dublin, and Provincial Colleges at which advanced instruction in Science is given.

Science.	Art.
(*a*) Grants of £2 each with travelling expenses to local teachers selected to attend short courses of instruction at Normal School of Science and Royal School of Mine (*b*) Grants of 21*s*. a week each with travelling expenses to teachers in training selected to attend the sessional courses of the Normal School of Science and Royal School of Mines. (*c*) Grants in aid of fees to local teachers selected to attend Provincial Science Colleges. (*d*) Free admission (subject to payment of examination fee) to courses of lectures at Normal School of Science and Royal School of Mines and Royal College of Science, to Science teachers.	(*a*) Grants to enable masters and students to visit various metropolitan Art Institutions, and, in special cases, foreign towns, schools, and galleries. (*b*) Grants of from 10*s*. to 35*s*. a week with travelling expenses to teachers in training selected to attend the National Art Training School.

9. Grants to Local Museums and Loans of works of Science and Art, Books, and specimen sets of teaching Apparatus, to Science and Art Schools.

10. Aid to Training Colleges for Instruction in Science and Art.

(*a*) Grants of £3 and £1 10*s*. respectively for each 1st and 2nd Class obtained at the Annual Examination. In Practical Chemistry £3 and £2. (*b*) Grants not exceeding 50 per cent. of the cost for apparatus and fittings.	(*a*) Grants of 10*s*. in respect of each subject of examination in which a resident student passes. (*b*) Grants of 50 per cent. towards the cost of examples.

11. Aid to Elementary Schools for Instruction in Drawing.

	(*a*) Grants of 1*s*., 1*s*. 6*d*., or 2*s*. on average attendance of Schools examined in Drawing. (*b*) Grants of 10*s*. for each pass in 2nd Grade Examinations.

12. Aid towards expenses of Examinations.

(*a*) Grants of 50 per cent. towards the fees of Special Local Secretaries and their Assistants for conducting annual examinations of Science and Art Schools and Classes.

SCIENTIFIC SERIALS.

American Journal of Science, July.—The viscosity of steel and its relations to temperature, by Carl Barus. In this paper the author's studies are mainly restricted to a discussion of the relation between torsional viscosity and temperature as observed with steel in different states of hardness. Reference is also made to the effect of stress on the amount of viscous motion in solids, and to a more general method by which the instantaneous deformation and the gradual deformation produced by stress may be co-ordinated. It is shown that imperceptible gradations lead from the purely viscous deformation which follows strains within the elastic limits to the sudden permanent set which follows strains beyond those limits.—Kilauea in 1880, by William T. Brigham. A detailed account is given of the results of the outbreak of May 1, 1880, with a description of the changes that had taken place since the author's previous visit in 1865. The trigonometrical survey then made was found to be already antiquated, the whole boundary perceptibly changed, and Kilauea apparently 5 per cent. larger than eighteen years previously.—Recent explorations in the Wappinger Valley limestone of Dutchess County, New York (continued), by W. B.

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